

59<sup>th</sup> Medical Wing, 59<sup>th</sup> Dental Squadron, Endodontics Flight:

Endodontics Chairman:

**Steven R. Hansen, Col., USAF, DC 47E3**

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**Bender IB. Factors influencing the radiographic appearance of bony lesions. J Endodon 1997;23:5-14.**

**PURPOSE:** To determine the percentage of mineral bone loss that is required to produce a radiolucent area.

**M&M:** Bone lesions were created in five flat sections of bone (not curvilinear either on the periosteal or endosteal side) cut from 5 different cadaver mandibles. Radiographs were taken of the cortical and trabecular bone at varying thicknesses at 65 KV<sub>p</sub>, 10 mA, exposed for 0.4 seconds, and developed under constant conditions. The lesions were cut in cortical bone on both the periosteal side and endosteal sides. Mineral bone loss (MBL) was calculated, and the radiolucent areas were classified according to four categories characterized by the degree of lucency.

**RESULTS:** The lowest percentage of cortical bone loss producing a radiolucent area was 12.5% with a 6.6% MBL. Distinct radiographic visualization with greater rarefaction was reported by all observers at 14.3% or more than 12.5% bone loss, with an average of 7.1% MBL. All three observers were in agreement regarding the latter result; whereas, in the former result, disagreement occurred in four observations. The sizes of the experimental lesions measured on the endosteal side were not too accurate. The thicker cortex needed a deeper cut to produce a radiographic visualization. Experimental lesions from 1 to 7 mm in most cancellous bone produced no radiolucent areas in cortical bone specimens 8 mm thick. The percentage of MBL in cancellous bone could not be determined.

**C&C:** The beginning of the paper has a very good descriptive review of the classical literature on radiographic detection of bone lesions. The ability to visualize lesions radiographically depends on the variations in thickness of hard structures, the constancy of composition according to mineral per unit volume of tissue, and the direction in which the X ray traverses the object (the angulation). The MBL was based on the conclusion that pure bone tissue consists of 50-55 volume percent of mineral, 30-35 percent of organic material, and 10-15 percent of water. The ability to detect radiographic lesions can vary depending on the location of the lesion in different bone sites (such as periosteal cortex, cancellous and junctional, or endosteal bone). The most consistent results with the least variations occurred in the periosteal cortical bone. Based on the results, the author concluded that the highest concentration of mineral per unit volume was located in the periosteal cortex, with slightly less in the endosteal cortex, and the least amount in the cancellous bone. The amount of MBL in cancellous bone does not significantly affect the radiographic results. Although it is generally agreed (in the literature) that 30% to 50% mineral loss is required before radiographic rarefaction is visualized in osteoporotic bone, these percentages *do not* apply in local resorptive lesions.

January 1997

Orest M. Harkacz, Sr.

**Haikel Y, Serfaty R, Bleicher P, Thin-Thin CL, Allemann C. Effects of cleaning, chemical disinfection, and sterilization procedures on the mechanical properties of endodontic instruments. J Endodon 1997 23:15-8.**

**PURPOSE:** To evaluate quantitatively, the effects of cross-infection control techniques on the mechanical properties of the files investigated.

**M&M:** Three file designs, Unifiles, Flexofile and H-File were tested to compare the values of torsional moment, torsional angular deflection, bending moment, and permanent angular deflection after being subjected to 11 different chemical and mechanical cleaning, disinfection and sterilization procedures (see JOE Dec 1996). 10 files of each type were subjected to each variation, plus ten which were tested w/out undergoing any infection-control techniques.

**RESULTS:** Comparing between file types, the Unifile had the highest control values for torsional moment and permanent angular deformation, and Flexofile the highest values for torsional angular deflection and bending moment. H-File had the lowest values except for permanent angular deflection, which belonged to Flexofile. This implies that Unifile is the most resistant to fracture of the three. Comparing within file groups, various ranges of change were noted in all groups after infection control measures. The largest change was seen in the H-file, having a 63% increase in the permanent angular deformation. All testing results were still within ANSI Specification 28.

**C&C:** It is not possible to predict the clinical performance of the files based on mechanical properties alone. This study is a well done, all encompassing mechanical evaluation of the files after disinfection and sterilization procedures. Some of the procedures, like 48 h soak in NaOCl may not be clinically relevant.

**January 1997**

**Robin E. Hinrichs**

**Harrison JW, Johnson SA. Excisional wound healing following the use of IRM as a root-end filling material. J Endodon 1997;23:19-27.**

**PURPOSE:** To determine the excisional wound healing responses of the periradicular tissues associated with IRM as a root-end filling material and to compare these responses with those associated with amalgam and orthograde gutta-percha root-end filling materials.

**M&M:** The mandibular premolars in 10 dogs were chemomechanically prepared and obturated with gutta-percha. The root-ends were resected and assigned to 4 groups. Groups A, B, and C were prepared for root-end filling using a micro-handpiece with a #4 round bur. Group D received no further treatment and served as controls (resected to orthograde gutta-percha). Groups A and B were root-end filled with IRM. Group C was root-end filled with Tytin. Healing responses were evaluated microscopically and radiographically at postsurgical intervals of 10 and 45 days.

**RESULTS:** The excisional wound healing responses associated with IRM root-end fillings were normal at both postsurgical intervals. There was no evidence of inhibition of dentoalveolar or osseous wound healing associated with IRM, amalgam, or orthograde gutta-percha. Statistical analysis showed no difference in wound healing between the 3 root-end filling materials.

**C&C:** Woven trabecular bone was present in the excisional wound as early as 10-days postoperative. The authors noted that the smear layer was not removed on the root-ends. According to Egelberg, cementum deposition may occur on smear layered dentin or cementum, but is attached to the resected root surface only through interlocking inorganic crystals connecting the new cementum, through the smear layer, to the root surface. There is no organic locking component to support this tenuous inorganic connection.

**January 1997**

**Orest M. Harkacz, Sr.**

**Bufflier P, Suchett-Kaye G, Morrier JJ, Benay G, Decoret D, Bonin P, Renard F, Barsotti O. In vitro evaluation of the antibacterial effects of intracanal micro plasma system treatment. J Endodon 1997;23:28-31.**

**PURPOSE:** To evaluate and compare the individual and combined antibacterial effectiveness of Micro Plasma System (MPS) treatment and NaOCl when used in the treatment of infected canals.

**M&M:** 40 single-rooted teeth were instrumented to size 25 with Hedstroms and flared coronal with #2, #3, and #4 Gates Glidden drills. After autoclaving, their apices were sealed with silicone. 4 groups were infected with *Actinomyces naeslundii*, cultured and dried. Group one acted as controls. Group 2 received 2 MPS treatments for 30 s. Group 3 received 20µl of 0.5% NaOCl for 3 min before being recovered and rinsed with a neutralizing solution. Group 4 received a combination of NaOCl followed by MPS. All teeth were sampled again with paper points which were incubated.

**RESULTS:** The control group showed no reduction of CFUs. The MPS had an 81.96% reduction, the 0.5% NaOCl had a 94.90% reduction and the combination group had a 99.48% reduction in CFUs.

**C&C:** For MPS to work the canal humidity must be minimal. The effect of MPS is obtained by the 3000<sup>0</sup> C temperature obtained by the plasma arc formed on contact with the root canal walls. A pinpoint thermic effect is obtained, while the energy is directed focally and not onto the entire root canal surface. It is powered by 220V. The authors used a time of application of 30 sec, stating that any longer resulted in a rise in tooth temperature. At this point, this device is unsuitable for clinical use. There is no way to control, or even evaluate the temperature increase on the apical tissues. What if the beam was directed out a patent apex on a man molar or premolar? What effect would this have on the Inferior Alveolar Nerve? NaOCl worked better.

**January 1997**

**Robin E. Hinrichs**

**Johnson MA, Primack PD, Loushine RJ, Craft DW. Cleaning of endodontic files, part I: the effect of bioburden on the sterilization of endodontic files. J Endodon 1997;23:32-34.**

**PURPOSE:** To evaluate for the presence of viable organisms from endodontic files contaminated with *Bacillus stearothermophilus* in an organic bioburden and then sterilized by either steam or chemical vapor sterilization.

**M&M:** The bioburden utilized in the experiment consisted of *Bacillus stearothermophilus*. Ninety-two new 21 mm length #25 K-Flex files were randomly assigned into 5 groups: group A - the negative control (neither contaminated nor sterilized before culture); group B - the positive control (10 files contaminated with bioburden, not cleaned and not sterilized before culture); group C - 24 files that were contaminated with bioburden and not cleaned - 12 were steam sterilized and 12 were sterilized with chemical vapor; group D - 24 files contaminated with bioburden and then cleaned with a detergent ultrasonic cleaner (L&R Cleaner Concentrate) - 12 were steam sterilized and 12 were sterilized with chemical vapor; group E - 24 files that were contaminated with bioburden then cleaned with an enzymatic ultrasonic cleaner (Coenzyme) - 12 were steam sterilized and 12 were sterilized with chemical vapor. To create the bioburden, the files were instrumented in bovine teeth containing the bacteria for 30 s. The files were then cultured for growth, and the SEM was used to image the files at D<sub>16</sub>.

**RESULTS:** At the 24 and 48 h periods all experimental groups (uncleaned and ultrasonically cleaned) that had been subjected to sterilization by either method produced no growth on both the agar plates and in the tubes of broth containing the files. All ten negative controls failed to produce growth in both the agar plates and the tubes of broth. All the positive controls exhibited growth on the agar plates at  $2.15 \times 10^3$  cells (average of all counts) and the broth tubes were turbid indicating growth. SEM revealed the presence of debris on commercially procured files before use. This bioburden was removed by precleaning. Intentionally contaminated files that were not cleaned but sterilized showed heavy bioburden. However, these files exhibited no bacterial growth after incubation in broth or media. There was no difference between contaminated files that were not cleaned before sterilization and contaminated files that were cleaned before sterilization.

**C&C:** The presence of bioburden did not affect the complete sterilization of endodontic files. Steam and chemical vapor sterilizers were equally effective in sterilizing both contaminated and cleaned files. The debris remaining on endodontic files after cleaning and sterilization could present problems in altering the sharpness of the file or in the dislodgment of sterile debris in a subsequent patient.

January 1997

Orest M. Harkacz, Sr.

**Malone KH III, Donnelly JC. An in vitro evaluation of coronal microleakage in obturated root canals without coronal restorations. J Endodon 1997;23:35-8.**

**PURPOSE:** To evaluate whether root canal obturation with a single GP cone and either Super EBA or Ketac-Endo root canal sealer could prevent bacterial penetration through the root canal in the absence of a coronal restoration.

**M&M:** The palatal or distal canals of 24 extracted max or man molars were used. The other roots were sectioned off, and the orifices sealed. After preparation to 1 mm short of apical foramen, the canals were obturated with single cones w/ Ketac-Endo or Super-EBA cements. The teeth were thermocycled 300 times before experimentation. A Teflon tube into the access cavity was placed and sealed and the tooth was suspended in a Trypticase soy broth. 0.5 ml human saliva was added to each tooth daily for 60 days. Initial problems with the coronal seal of the apparatus were corrected. 4 control teeth were used, 2 positive and 2 negative.

**RESULTS:** All samples in the study that became turbid did so because of coronal leakage of the apparatus. No turbidity resulted from leakage through the canal.

**C&C:** This study had it's problems but ultimately produced reportable results. Although 60 days is short term, it seems that these obturation techniques and materials offer some resistance to coronal leakage. No mention was made of Super EBA's handling characteristics.

**January 1997**

**Robin E. Hinrichs**

**Hosoya S, Matsushima K. Stimulation of interleukin-1 $\beta$  production of human dental pulp cells by *Porphyromonas endodontalis* lipopolysaccharide. *J Endodon* 1997;23:39-42.**

**PURPOSE:** To examine IL-1 $\beta$  release, IL-1 $\beta$  converting enzyme (ICE) activity, and the IL-1 $\beta$  mRNA levels in human dental pulp cells treated with the lipopolysaccharide (LPS) of *Porphyromonas endodontalis*.

**M&M:** LPS was prepared from bacterial cultures of *Porphyromonas endodontalis*. Human dental pulp (HDP) cells were obtained from permanent, noncarious teeth extracted for orthodontic reasons. Assays were performed to determine IL-1 $\beta$  production, ICE activity, and the Northern-blot hybridization analysis of IL-1 $\beta$  mRNA in HDP cells.

**RESULTS:** LPS stimulated IL-1 $\beta$  release from HDP cells in a time- and dose-dependent manner. However, ICE activity was not increased by LPS. Northern blot hybridization analysis revealed that the IL-1 $\beta$  mRNA level in HDP cells was increased by LPS.

**C&C:** *P. endodontalis* was utilized because it is a Gram-negative bacteria isolated from infected root canals which has been detected in radicular cysts and chronic root canal inflammations, and may play a role in pulpal and periapical diseases. These results suggest that stimulation of IL-1 $\beta$  release from HDP cells by *P. endodontalis* LPS may have an important role in the progression of inflammation in pulpal and periapical disease. In the presence of IL-1, proliferation of resting T and B lymphocytes to growth factors is enhanced, differentiation and antibody production are augmented, and the binding of natural killer lymphocytes to their tumor targets is increased. IL-1 is also a chemoattractant for lymphocytes, and stimulates the acute-phase proteins such as complement protein (C3). IL-1 $\beta$  treated osteogenic cells showed significantly elevated levels of PGE, bone resorption, and osteoclast-like cell formation, as compared with nonstimulated cells. IL-1 $\beta$  was reported to stimulate collagenase activity in gingival fibroblasts and skin fibroblasts. In dental pulp disease, increases in levels of IL-1 $\beta$  in pulpitis might also stimulate inflammation.

January 1997

Orest M. Harkacz, Sr.



**Margelos J, Eliades G, Verdelis C, Palaghias G. Interaction of calcium hydroxide with zinc oxide-eugenol type sealers: a potential clinical problem. J Endodon 1997;23:43-8.**

**PURPOSE:** To investigate whether an interaction occurs between calcium hydroxide and zinc oxide-eugenol cement, between calcium hydroxide and zinc oxide-eugenol sealers and to preliminarily assess the calcium hydroxide removal efficiency from root canals of various agents.

**M&M:** A layer of zinc oxide-eugenol cement was placed on a KRS-5 crystal to enable the spectroscopic examination of the material. Spectra were recorded immediately and 5, 10, 20, and 30 min after. After cleaning, the crystal had a layer of zinc oxide-eugenol cement placed on it and then a layer of calcium hydroxide placed. Analysis was again accomplished at the same time intervals. The experiment was repeated using zinc oxide-eugenol sealers Roth 811, and Procosol. Peak absorbency ratios were used to calculate the sealer setting rates. A separate experiment designed to test the calcium hydroxide removal efficiency was set up. Irrigation w/ 2.25% NaOCl and paper point drying, irrigation with 2.25% NaOCl and use of the largest file during instrumentation, irrigation w/ 2.25% NaOCl and 15% EDTA along with the largest file, and no treatment were evaluated.

**RESULTS:** Calcium hydroxide preferentially interacted with eugenol inhibiting the ZnO-Eugenol chelate formation. The set zinc oxide-eugenol cement and zinc oxide-eugenol-type sealers in contact with calcium hydroxide were brittle in consistency and granular in structure. The set product contained residual eugenol. The set of the zinc oxide-eugenol cement and sealers was accelerated. None of the treatments completely removed the calcium hydroxide from root canals, but EDTA significantly reduced the extent of residual calcium hydroxide.

**C&C:** Anything that decreases the coronal seal is of concern. Short term implications are the increased setting action which may hinder placement of cones during obturation. Long-term implications involve the potential decrease in sealing ability of the Cavit, and long-term release of unbound eugenol. The ultrasonic was not evaluated here as to its efficiency in removal of the calcium hydroxide medicament.

**January 1997**

**Robin E. Hinrichs**

**Baumann MA, Doll GM. Spatial reproduction of the root canal system by magnetic resonance microscopy. J Endodon 1997;23:49-51.**

**PURPOSE:** To achieve an accurate spatial reproduction of the root canal system of extracted teeth by magnetic resonance microscopy (MRM).

**M&M:** Extracted teeth were placed in 10% formalin and 90% water containing a lot of protons. The teeth were imaged using MRM. Measurements were performed in a Bruker spectrometer AMX 300 WB with a 89 mm magnet (300 Mhz), 7 Tesla field strength, and a microimaging unit. The data processing was carried out by a 3D-Fourier analysis and reconstructions were done by the UXNMR (Bruker) software system. The voxel resolution isotropically reached 98  $\mu\text{m}$ , so that insights into the interior of teeth on a microscopic level could be obtained.

**RESULTS:** The spatial reconstruction of the root canal system could be depicted in all parts from crown pulp to even small lateral canals. Within the pulp, tissue differences in its tissue texture were ascertained.

**C&C:** As the necessary strong magnetic fields presently are not allowed to be used in people and as the acquisition of data is costly, the noninvasive MRM technique presently can be applied only in nonclinical situations. Among the metals, only iron or nickel interfere with MR-imaging. Amalgam fillings and gold restorations in teeth do not cause any problems.

**January 1997**

**Orest M. Harkacz, Sr.**

***Lopes MA, Spolidoria LC, Peres Line SR, de Almeida OP. Pulpal lesions in normal and cyclosporin a treated rats. J Endodon 1997;23:52-3.***

**PURPOSE:** To examine the development of pulpal lesions in the lower molar of control and Cyclosporin A treated rats.

**M&M:** 40 rats, 20 immunosuppressed w/ Cyclosporin A and 20 not had pulp exposures created in all lower 1st molars. Rats were sacrificed after 7, 14, 21 and 28 days of exposure, and the tissues examined. Each of the four roots was examined.

**RESULTS:** Necrosis was similar in control and Cy A treated rats. Necrosis was greatest in the root closest to the pulp exposure. The pulp became progressively necrotic at each time interval (34%, 70%, 88%, and 93%).

**C&C:** The results indicate that Cy A, or immunosuppression in rats does not modify the defense mechanisms of their dental pulps after exposure to the oral cavity. Whether this is applicable to humans is not known.

**January 1997**

**Robin E. Hinrichs**

**Bertrand MF, Pellegrino JC, Rocca JP, Klinghofer A, Bolla M. Removal of thermafil root canal filling material. J Endodon 1997;23:54-7.**

**PURPOSE:** To verify if removal of Thermafil plastic carriers and reestablishment of working length were possible in single rooted canals filled with Thermafil system.

**M&M:** Twenty freshly extracted maxillary central incisors were prepared and filled with #30 Thermafil plastic obturators according to manufacturer's recommendations using Endobtur sealer. The access cavity was filled with IRM. After cement set (24 hours later), the teeth were divided into 2 groups: Group I - 10 teeth were retreated using dimethylformamide as a solvent; group II - 10 teeth were retreated using chloroform as a solvent. Removal of filling material was performed manually using K files and H files alternately between carrier and dentinal walls.

**RESULTS:** The average time needed to remove the plastic carrier was 7 min for group I and approximately 6 1/2 min for group II. Complete removal of filling material was successful in 18 instances. No deformation of the plastic carrier was observed after removal from the canal.

**C&C:** The two different solvents were evaluated because the Thermafil carriers are composed of 2 different materials. Dimethylformamide is one of the components used to retreat canals filled with phenoplastic resin pastes, so its effects on the plastic portion of the Thermafil carrier was evaluated. Chloroform is known to be effective against gutta-percha, so it was evaluated for its effect on the gutta-percha portion of the carrier. In this study, when either solvent was used, the carriers were removed intact, with no deformation. No action on the plastic carrier was demonstrated when using either dimethylformamide or chloroform.

**January 1997**

**Orest M. Harkacz, Sr.**

**O'Neal KM, Gound TG, Cohen DM. Preeruptive idiopathic coronal resorption: a case report. J Endodon 1997;23:58-9.**

**SUMMARY:** A case report presenting a 12 caucasian male w/ an unerupted 2nd molar that had radiographic of an intracoronal radiolucency. Surgical exposure and access into the molar revealed a yellow gel-like substance with no dentin present that communicated with the pulp. The pulp appeared vital, and after curettage of the lesion, calcium hydroxide powder was placed in an apexogenesis procedure. IRM was placed as the restorative material in the access, and the flap was sutured back over the tooth. Follow-up at 3 mo, 7 mo 1 yr. and 18 months revealed a normally developing root system, but the tooth still had not completely erupted. At 18 mo, though partially erupted, the IRM was noted to be breaking down, so it was re-entered. RD isolation was not possible. The previous material in the crown was removed, and Dycal placed over the MB and ML pulp horn remnants. No hemorrhage was present. An occlusal amalgam was then placed. At 21 month posttreatment examination, the tooth was asymptomatic and responded to an EPT. C&C: An interesting case, which shows how effective apexogenesis can be when no bacteria are present.

**January 1997**

**Robin E. Hinrichs**

***DeGrood ME, Cunningham CJ. Mandibular molar with 5 canals: report of a case. J Endodon 1997;23:60-2.***

**SUMMARY:** A case of a mandibular molar with 5 canals is described. Literature pertaining to the analysis of the morphology of mandibular first molars is reviewed.

**January 1997 Orest M. Harkacz, Sr.**